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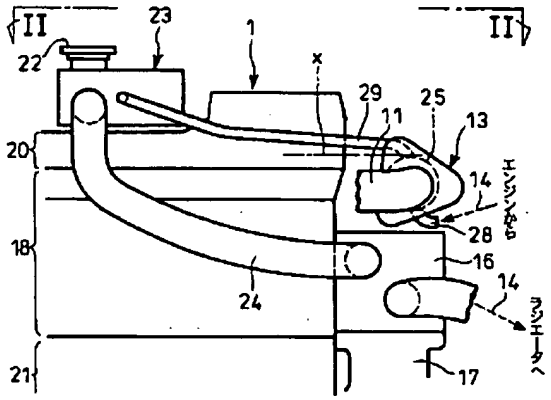
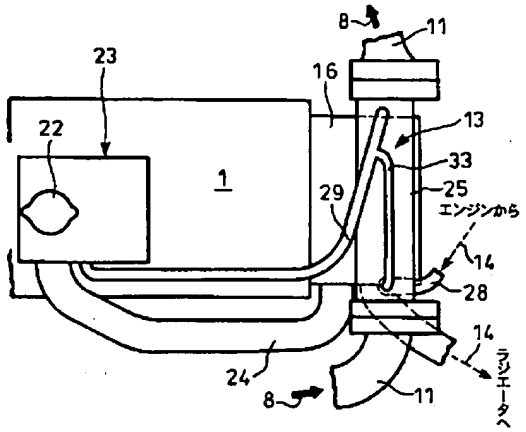
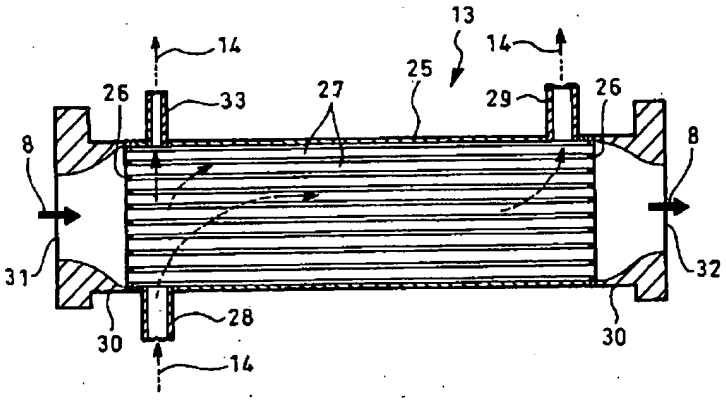
【図1】



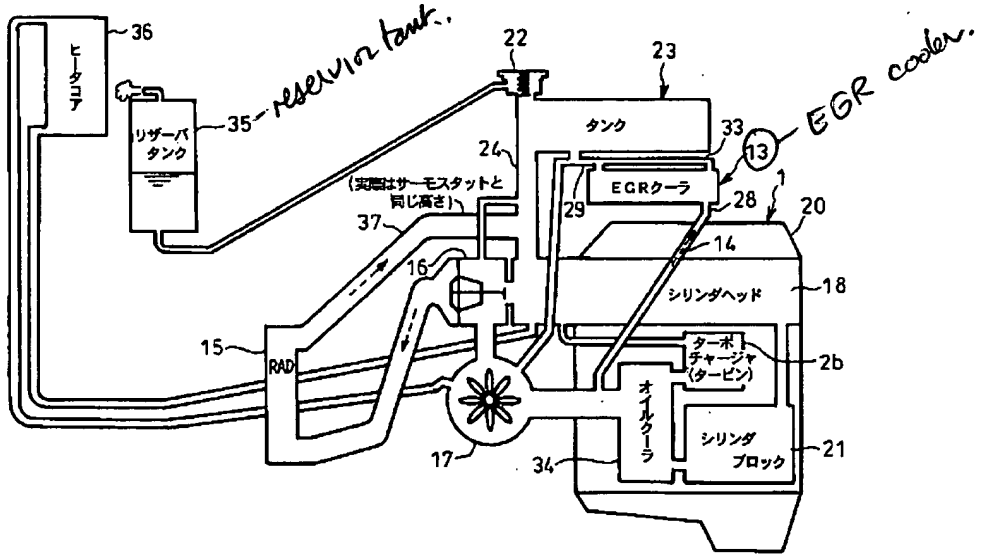
【図2】



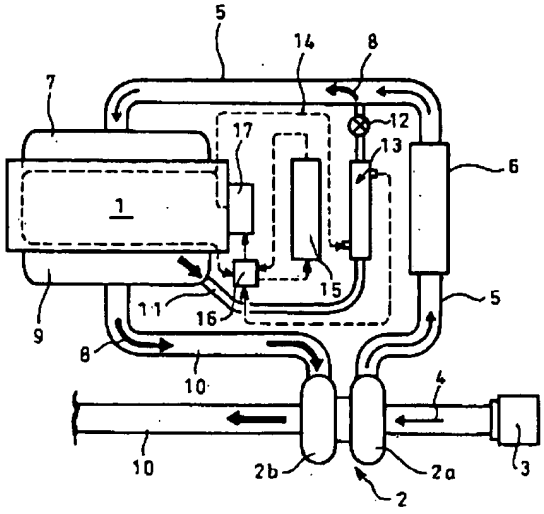
【図3】



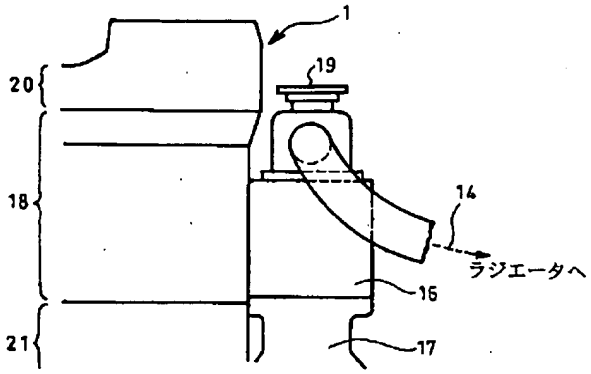
【図4】



【図5】



【図6】



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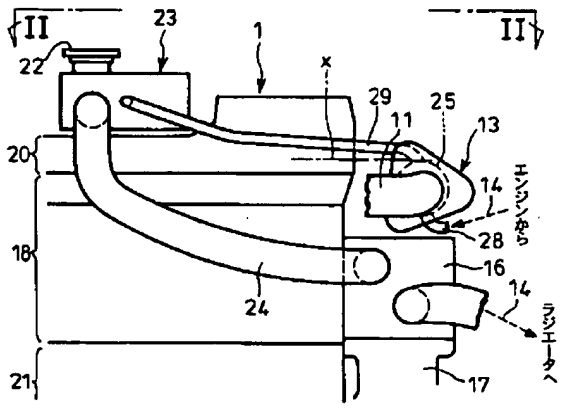
(54)【発明の名称】　車両用水冷系統のエア抜き構造

(57)【要約】
【課題】　冷却水を注ぎ込むための注水口の高さ位置による制約を受けることなく、水冷式のＥＧＲクーラをシリンダヘッドより上方に搭載し得、且つ冷却水の気水分離を良好に行うことができ、エンジンをコンパクト化して車両への搭載性を向上し得る車両用水冷系統のエア抜き構造を提供する。
【解決手段】　エンジン１のヘッドカバー２０の上に、ＥＧＲクーラ１３の水冷領域の最上レベルｘより高い位置に冷却水１４の注水口２２が設けられ且つ該注水口２２に注ぎ込まれた冷却水１４をサーモスタット１６に対し連絡管２４を介して導き得るようにしたエア溜まり機能を有するタンク２３を設ける。



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【特許請求の範囲】

【請求項1】　水冷式のＥＧＲクーラが設けられる車両用水冷系統のエア抜き構造であって、

ＥＧＲクーラの水冷領域の最上レベルより高い位置に冷却水の注水口が設けられ且つ該注水口に注ぎ込まれた冷却水を水冷系統中の適宜な箇所に導き得るようにしたエア溜まり機能を有するタンクを備えたことを特徴とする車両用水冷系統のエア抜き構造。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明は、車両用水冷系統のエア抜き構造に関するものである。

【０００２】

【従来の技術】従来より、トラック等の車両のエンジンでは、排気側から排気ガスの一部を抜き出して吸気側へ戻し、該吸気側に戻された排気ガスによってエンジン内での燃料の燃焼を抑制させて燃焼温度を下げることによりＮＯｘ（窒素酸化物）の発生を低減させるようにした、いわゆる排気ガス再循環（ＥＧＲ：Exhaust Gas Recirculation）が行われている。

【０００３】一般的に、この種の排気ガス再循環を行う場合には、排気マニホールドから排気管に亘る排気通路の適宜位置と、吸気管から吸気マニホールドに亘る吸気通路の適宜位置との間をＥＧＲパイプにより接続し、該ＥＧＲパイプを通して排気ガスを再循環させるようにしている。

【０００４】又、エンジンに再循環させる排気ガスをＥＧＲパイプの途中で冷却すると、排気ガスの温度が下がり且つその容積が小さくなることにより、エンジンの出力を余り低下させずに燃焼温度を低下させて効果的にＮＯｘの発生を低減させることができるため、エンジンに排気ガスを再循環させるＥＧＲパイプの途中に水冷式のＥＧＲクーラを装備したものもある。

【０００５】図５は前記ＥＧＲクーラを装備したエンジンの一例を示すものであって、図５中、１はディーゼル機関であるエンジンを示し、該エンジン１は、ターボチャージャ２を備えたものとなっており、エアクリーナ３から導入した吸気４を吸気管５を通し前記ターボチャージャ２のコンプレッサ２ａへ送り、該コンプレッサ２ａで加圧された吸気４をインタークーラ６へ送って冷却し、該インタークーラ６から更に吸気マニホールド７へ吸気４を導いてエンジン１の各気筒に分配するようにしてあり、又、このエンジン１の各気筒から排出された排気ガス８を排気マニホールド９を介し前記ターボチャージャ２のタービン２ｂへ送り、該タービン２ｂを駆動した排気ガス８を排気管１０を介し車外へ排出するようにしてある。

【０００６】そして、ターボチャージャ２のタービン２ｂより上流側の排気管１０（図５の例では排気マニホールド９）と、ターボチャージャ２のコンプレッサ２ａより下流側の吸気管５との間がＥＧＲパイプ１１により接続されており、排気マニホールド９から排気ガス８の一部を抜き出して吸気管５に導き得るようにしてある。

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【０００７】ここで、前記ＥＧＲパイプ１１には、排気ガス８の再循環量を適宜に調節するためのＥＧＲバルブ１２と、再循環される排気ガス８を冷却するためのＥＧＲクーラ１３とが装備されており、該ＥＧＲクーラ１３では、冷却水１４と排気ガス８とを熱交換させることにより排気ガス８の温度を低下させ得るようになっている。

【０００８】又、前述の如きエンジン１においては、該エンジン１に導入されたばかりの比較的圧力の高い冷却水１４の一部をエンジン１側から抜き出してＥＧＲクーラ１３での冷却に利用し、該ＥＧＲクーラ１３で排気ガス８と熱交換して昇温した冷却水１４を、前記エンジン１を経由して昇温した冷却水１４に対しサーモスタット１６において合流させてラジエータ１５に導くようにしている。

【０００９】尚、このような冷却水１４の循環は、エンジン１により駆動されるクーラントポンプ１７で行われるようになっており、エンジン１の始動直後等における冷却水１４の温度が低い時には、サーモスタット１６の作動でラジエータ１５からの戻りの水路を閉じ且つエンジン１からの冷却水１４をクーラントポンプ１７へ導く水路を開けることにより、冷却水１４をラジエータ１５を経由させずにクーラントポンプ１７へ直接送り込んでエンジン１の過冷却を回避し得るようにしてある。

【００１０】

【発明が解決しようとする課題】しかしながら、前述の如き車両においては、エンジン１やラジエータ１５等を含む全ての水冷系統を満水とするべく最初に冷却水１４を注ぎ込むための注水口の高さ位置によりＥＧＲクーラ１３の配置が著しく制約を受けるという不具合があった。

【００１１】即ち、図６に示される如く、特に中型トラック等の車両においては、一般にエンジン１のシリンダヘッド１８が全ての水冷系統のうちの最上位置となっているので、エンジン１の前面に取り付けられているサーモスタット１６等に前記シリンダヘッド１８より高い位置で開口するように注水口１９を設けているが、この注水口１９の開口レベルにより全ての水冷系統の液面レベルが決まってしまうので、前記注水口１９の開口レベルより低い位置にＥＧＲクーラ１３を配置せざるを得ず、仮に、前記注水口１９の開口レベルより低い位置にＥＧＲクーラ１３を配置しないと、該ＥＧＲクーラ１３内の水冷領域における完全なエア抜きが難しくなり、ＥＧＲクーラ１３の水冷領域に残存した空気溜まりにより局所的な過熱部分（排気ガス８と冷却水１４との熱交換不良部）が生じた際に応力集中による破損が生じる虞れがあった。

【００１２】又、ＥＧＲクーラ１３が装備されるＥＧＲパイプ１１は、エンジン１の一側の排気系統から他側の吸気系統へと車幅方向に渡して配置しなければならず、エンジン１の高さ寸法内にＥＧＲクーラ１３を収めようとした場合には、ＥＧＲパイプ１１をエンジン１の前側か後側を回して車幅方向に渡さざるを得ないが、エンジン１の前側におけるシリンダヘッド１８より下側にはサーモスタット１６やクーラントポンプ１７等が配置され、一方、エンジン１の後側におけるシリンダヘッド１８より下側にはトランスミッション等が配置されているので、現状の特に中型トラック等の車両の構造に対し注水口１９の開口レベルより低い位置にＥＧＲクーラ１３を収めて配置することは極めて困難な状況となっている。尚、図６中、２０はシリンダヘッド１８の上部に取り付けられるヘッドカバー、２１はシリンダブロックを示している。

【００１３】本発明は、斯かる実情に鑑み、冷却水を注ぎ込むための注水口の高さ位置による制約を受けることなく、水冷式のＥＧＲクーラをシリンダヘッドより上方に搭載し得、且つ冷却水の気水分離を良好に行うことができ、エンジンをコンパクト化して車両への搭載性を向上し得る車両用水冷系統のエア抜き構造を提供しようとするものである。

【００１４】

【課題を解決するための手段】本発明は、水冷式のＥＧＲクーラが設けられる車両用水冷系統のエア抜き構造であって、ＥＧＲクーラの水冷領域の最上レベルより高い位置に冷却水の注水口が設けられ且つ該注水口に注ぎ込まれた冷却水を水冷系統中の適宜な箇所に導き得るようにしたエア溜まり機能を有するタンクを備えたことを特徴とする車両用水冷系統のエア抜き構造にかかるものである。

【００１５】上記手段によれば、以下のような作用が得られる。

【００１６】シリンダヘッドを超える高さ位置に水冷式のＥＧＲクーラを配置しても、タンクにおける冷却水の注水口の開口レベルがＥＧＲクーラの水冷領域の最上レベルより高くなり、しかも、前記タンクはエア溜まり機能を有しているので、ＥＧＲクーラ内の水冷領域における完全なエア抜きが容易に実現され、該ＥＧＲクーラ１３の水冷領域に空気溜まりが残存しなくなり、排気ガス８と冷却水１４との熱交換不良に伴う局所的な過熱部分が発生せず、応力集中による破損が生じる心配もなくなり、エンジンをコンパクト化することが可能となる。

【００１７】

【発明の実施の形態】以下、本発明の実施の形態を図示例と共に説明する。

【００１８】図１～図４は本発明を実施する形態の一例であって、図中、図５及び図６と同一の符号を付した部分は同一物を表わしている。

【００１９】本図示例においては、前述した図６の如きサーモスタット１６上部に注水口１９を設けた構造を廃止して前記サーモスタット１６の上部にスペースをつくり、このスペースに水冷式のＥＧＲクーラ１３を配置するようにしている。

【００２０】前記ＥＧＲクーラ１３は、エンジン１のシリンダヘッド１８を超える高さ位置に配置されることになるが、前記エンジン１のヘッドカバー２０の上に、ＥＧＲクーラ１３の水冷領域の最上レベルｘより高い位置に冷却水１４の注水口２２が設けられ且つ該注水口２２に注ぎ込まれた冷却水１４をサーモスタット１６に対し連絡管２４を介して導き得るようにしたエア溜まり機能を有するタンク２３を設け、これにより注水口２２の開口レベルがＥＧＲクーラ１３の水冷領域の最上レベルｘより高くなるようにしている。

【００２１】ここで、図３により前記ＥＧＲクーラ１３の内部構造について説明すると、この種のＥＧＲクーラ１３では、円筒状に形成されたシェル２５の軸心方向両端に、シェル２５の端面を閉塞するようプレート２６，２６が固着されていて、該各プレート２６，２６には、多数のチューブ２７の両端が貫通状態で固着されており、これら多数のチューブ２７はシェル２５の内部を軸心方向に延びている。

【００２２】そして、シェル２５の一方の端部近傍には、エンジン１側から冷却水１４を導くようにした冷却水導入管２８が接続され、また、シェル２５の他方の端部近傍には、該シェル２５内部の冷却水１４を前記タンク２３におけるＥＧＲクーラ１３の水冷領域の最上レベルｘより高い位置に排出する冷却水排出管２９（図１及び図２参照）が接続されており、冷却水１４が冷却水導入管２８からシェル２５の内部に供給されてチューブ２７の外側を流れ、冷却水排出管２９からシェル２５の外部に排出されるようになっている。

【００２３】即ち、このシェル２５内部の冷却水１４で満たされる領域が、前述したＥＧＲクーラ１３の水冷領域となるので、例えば、ＥＧＲクーラ１３が略水平な配置であるならば、このシェル２５の内部空間の上端位置が水冷領域の最上レベルｘということになる。

【００２４】更に、各プレート２６，２６の反シェル２５側には、内部空間を椀状に形成されたボンネット３０，３０が前記各プレート２６，２６の端面を被包するように固着され、一方のボンネット３０の中央には排気ガス入口３１が、他方のボンネット３０の中央には排気ガス出口３２がそれぞれ設けられており、エンジン１から排出される排気ガス８が排気ガス入口３１から一方のボンネット３０の内部に入り、多数のチューブ２７内部を通る間に該チューブ２７の外側を流れる冷却水１４との熱交換により冷却された後に、他方のボンネット３０の内部に排出されて排気ガス出口３２からエンジン１に再循環されるようになっている。

【0025】尚、図3中、33は冷却水導入管28に対しシェル25の直径方向に対峙する位置に設けたバイパス出口管を示し、該バイパス出口管33から冷却水14の一部を抜き出すことにより、冷却水導入管28に対峙する箇所に冷却水14の澱みが生じないようにしてある。

【0026】一方、前述の如く構成した水冷系統の各構成要素の高さ関係を模式的に表わすと、図4に示すようになり、前記タンク23は、水冷系統におけるラジエータ15、サーモスタット16、クーラントポンプ17、オイルクーラ34、ターボチャージャ2のタービン2b、シリンダブロック21、シリンダヘッド18、及びEGRクーラ13より高く設置され、前記タンク23における冷却水14の注水口22には、冷却水14の温度上昇に伴う体積膨張を吸収するためのリザーバタンク35が接続され、又、エンジン1を冷却して温度上昇した冷却水14は、ヒータコア36へ導入され、ヒータの熱源として利用されるようになっている。尚、ラジエータ15で冷却された冷却水14の循環配管37は、図4において、サーモスタット16より上方に位置するよう図示してあるが、実際にはサーモスタット16と同じ高さに配置されるものである。

【0027】次に、上記図示例の作動を説明する。

【0028】シリンダヘッド18を超える高さ位置に水冷式のEGRクーラ13を配置しても、タンク23における冷却水14の注水口22の開口レベルがEGRクーラ13の水冷領域の最上レベルxより高くなり、しかも、前記タンク23はエア溜まり機能を有しているので、最初に注水口22から冷却水14を注ぎ込んで全ての水冷系統を満たす際には、EGRクーラ13内の水冷領域における水位の上昇に伴い、EGRクーラ13内の上側の空気が無理なく冷却水排出管29からタンク23側へと抜き出され、EGRクーラ13内の満水時には、自ずから空気溜まりの残らない完全なエア抜きが実現されることになる。

【0029】この結果、EGRクーラ13内の水冷領域における完全なエア抜きが容易に実現され、該EGRクーラ13の水冷領域に空気溜まりが残存しなくなり、排気ガス8と冷却水14との熱交換不良に伴う局所的な過熱部分が発生せず、応力集中による破損が生じる心配もなくなり、エンジン1をコンパクト化することが可能となる。

【0030】こうして、冷却水14を注ぎ込むための注水口22の高さ位置による制約を受けることなく、水冷式のEGRクーラ13をシリンダヘッド18より上方に搭載し得、且つ冷却水14の気水分離を良好に行うことができ、エンジン1をコンパクト化して車両への搭載性を向上し得る。

【0031】尚、本発明の車両用水冷系統のエア抜き構造は、上述の図示例にのみ限定されるものではなく、本発明の要旨を逸脱しない範囲内において種々変更を加え得ることは勿論である。

【0032】

【発明の効果】以上、説明したように本発明の車両用水冷系統のエア抜き構造によれば、冷却水を注ぎ込むための注水口の高さ位置による制約を受けることなく、水冷式のEGRクーラをシリンダヘッドより上方に搭載し得、且つ冷却水の気水分離を良好に行うことができ、エンジンをコンパクト化して車両への搭載性を向上し得るという優れた効果を奏し得る。

【図面の簡単な説明】

【図1】本発明を実施する形態の一例の要部側面図である。

【図2】図1のII-II矢視図である。

【図3】図1及び図2におけるEGRクーラの内部構造の詳細を示す断面図である。

【図4】本発明を実施する形態の一例における水冷系統の各構成要素の高さ関係を表わす全体概略模式図である。

【図5】EGRクーラを搭載した車両の給排気系統と水冷系統の一例を示す概略平面図である。

【図6】車両における注水口の設置例を示す側面図である。

【符号の説明】

1　エンジン
8　排気ガス
11　EGRパイプ
12　EGRバルブ
13　EGRクーラ
14　冷却水
15　ラジエータ
16　サーモスタット
17　クーラントポンプ
18　シリンダヘッド
20　ヘッドカバー
21　シリンダブロック
22　注水口
23　タンク
24　連絡管
29　冷却水排出管
x　最上レベル

PAT-NO: JP02003278544A

DOCUMENT-IDENTIFIER: JP 2003278544 A

TITLE: AIR BLEEDING STRUCTURE FOR VEHICULAR WATER COOLING SYSTEM

PUBN-DATE: October 2, 2003

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APPL-DATE: March 26, 2002

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ABSTRACT:

PROBLEM TO BE SOLVED: To provide an air bleeding structure for a vehicular water cooling system, wherein a water cooling EGR cooler is mounted above a cylinder head without limitation by height position of a water injection port for injecting cooling water, gas-liquid separation of the cooling water is finely conducted, and mounting performance to a vehicle is improved by making an engine compact.

SOLUTION: A tank 23 provided with the water injection port 22 of the cooling water 14 at a position higher than the maximum level x of a water cooling range of the EGR cooler 13, and having an air collecting function leading the cooling water 14 injected into the water injection port 22 to a thermostat 16 through a connecting pipe 24 is provided on a head cover 20 of the engine 1.

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[Field of the Invention] This invention relates to the degassing structure of the water-cooled network for cars.
[0002]
[Description of the Prior Art] Conventionally, with the engine of cars, such as a truck, the so-called exhaust gas recycling (EGR:Exhaust Gas Recirculation) it was made to reduce generating of NOx (nitrogen oxides) is performed by making combustion of the fuel within an engine control and lowering combustion temperature with the exhaust gas which extracted a part of exhaust gas from the exhaust side, returned to the inspired air flow path, and was returned to this inspired air flow path.
[0003] Generally, in performing this kind of exhaust gas recycling, between the proper locations of the inhalation-of-air path suitably ranging from the inlet pipe to a location and an inlet manifold of the flueway ranging from the exhaust manifold to an exhaust pipe is connected with an EGR pipe, and it is made to carry out recycling of the exhaust gas through this EGR pipe.
[0004] Moreover, if the exhaust gas which carries out recycling to an engine is cooled in the middle of an EGR pipe, since it can reduce combustion temperature, without reducing an engine output not much when the temperature of exhaust gas falls and the volume becomes small and generating of NOx can be reduced effectively, there are some which equipped the EGR cooler of a water cooling type in the middle of the EGR pipe which carries out recycling of the exhaust gas to an engine.
[0005] Drawing 5 shows an example of the engine which equipped said EGR cooler, and one shows the engine which is a Diesel engine among drawing 5 . This engine 1 An inlet pipe 5 to compressor 2a of the through aforementioned turbocharger 2 for the inhalation of air 4 which is the thing equipped with the turbocharger 2 and was introduced from the air cleaner 3 Delivery, Send the inhalation of air 4 pressurized by this compressor 2a to an intercooler 6, and it cools. Lead inhalation of air 4 to an inlet manifold 7 further from this intercooler 6, and it is made to have distributed to each gas column of an engine 1. Moreover, the exhaust gas 8 which drove delivery and this turbine 2b for the exhaust gas 8 discharged from each gas column of this engine 1 to turbine 2b of said turbocharger 2 through the exhaust manifold 9 is discharged out of the vehicle through the exhaust pipe 10.
[0006] And between the inlet pipes 5 of the downstream is connected with the exhaust pipe 10 (the example of drawing 5 exhaust manifold 9) of the upstream by compressor 2a of a turbocharger 2 with the EGR pipe 11 from turbine 2b of a turbocharger 2, and a part of exhaust gas 8 is extracted from an exhaust manifold 9, and it is made to have led to the inlet pipe 5.
[0007] Here, said EGR pipe 11 is equipped with EGR valve 12 for adjusting the amount of recycling of exhaust gas 8 suitably, and EGR cooler 13 for cooling the exhaust gas 8 by which recycling is carried out, and it may have comes to fall the temperature of exhaust gas 8 in this EGR cooler 13 by carrying out heat exchange of cooling water 14 and the exhaust gas 8.
[0008] Moreover, some cooling water 14 with a comparatively high pressure just introduced into this engine 1 is extracted from an engine 1 side, and it uses for cooling by EGR cooler 13, and he makes the

cooling water 14 which carried out heat exchange to exhaust gas 8 and which carried out the temperature up join in a thermostat 16 to the cooling water 14 which carried out the temperature up via said engine 1 by this EGR cooler 13, and is trying to lead to a radiator 15 in the engine 1 like the above-mentioned.

[0009] In addition, circulation of such cooling water 14 is performed by the coolant pump 17 driven with an engine 1. When the temperature of the cooling water 14 in immediately after starting of an engine 1 etc. is low By opening the channel which closes the channel of the return from a radiator 15 by actuation of a thermostat 16, and leads the cooling water 14 from an engine 1 to a coolant pump 17 Cooling water 14 is directly sent into a coolant pump 17, without making it go via a radiator 15, and it enables it to have avoided the supercooling of an engine 1.

[0010]

[Problem(s) to be Solved by the Invention] However, in the car like the above-mentioned, there was fault that arrangement of EGR cooler 13 received constraint remarkably with the height location of the filling port for pouring in cooling water 14 first in order to consider all the water-cooled networks containing an engine 1 or radiator 15 grade as full of water.

[0011] Namely, as shown in drawing 6 , it sets on cars, such as a medium size truck, especially. Although the filling port 19 is provided so that opening may be carried out to the thermostat 16 grade attached in the front face of an engine 1 in a location higher than said cylinder head 18 since the cylinder head 18 of an engine 1 generally serves as the best location of all the water-cooled networks Since the oil-level level of all water-cooled networks is decided by opening level of this filling port 19 a location lower than the opening level of said filling port 19 -- EGR cooler 13 -- not arranging, if it does not obtain and EGR cooler 13 is not arranged in a location lower than the opening level of said filling port 19 Perfect degassing in the water-cooled field in this EGR cooler 13 became difficult, and when generated by the amount of (poor heat exchange section of exhaust gas 8 and cooling water 14) local hot spot with the accumulator ball which remained to the water-cooled field of EGR cooler 13, there was a possibility that breakage by stress concentration might arise.

[0012] Moreover, the EGR pipe 11 equipped with EGR cooler 13 When the induction system of the side else must be passed at the cross direction, it must arrange from the exhaust system by the side of one of an engine 1 and it is going to store EGR cooler 13 in the height dimension of an engine 1 Although before an engine 1 and the backside must be turned and the EGR pipe 11 must be passed to the cross direction Below the cylinder head 18 by the side of before an engine 1, a thermostat 16 and coolant pump 17 grade are arranged. On the other hand, since transmission etc. is arranged below the cylinder head 18 on the backside [an engine 1] Especially the present thing for which EGR cooler 13 is stored and arranged in a location lower than the opening level of a filling port 19 to the structure of cars, such as a medium size truck, serves as a very difficult situation. In addition, the cylinder-head cover with which 20 are attached in the upper part of the cylinder head 18, and 21 show the cylinder block among drawing 6 .

[0013] Without receiving constraint by the height location of the filling port for pouring in cooling water in view of this actual condition, this invention may carry the EGR cooler of a water cooling type more nearly up than the cylinder head, and can perform steam separation of cooling water good, and tends to offer the degassing structure of the water-cooled network both for a vehicle which miniaturizes an engine and may improve the loading nature to a car.

[0014]

[Means for Solving the Problem] This invention is the degassing structure of the water-cooled network both for a vehicle where of the EGR cooler of a water cooling type is prepare , and starts the degassing structure of the water-cooled network both for a vehicle characterize by to have the tank which has the air ****** function in which it was made to lead the cooling water which the filling port of cooling water was prepared in the location higher than the best level of the water-cooled field of an EGR cooler , and was poured into this filling port to the proper part in a water-cooled network .

[0015] According to the above-mentioned means, the following operations are acquired.

[0016] Even if it arranges the EGR cooler of a water cooling type in the height location exceeding the

cylinder head Since the opening level of the filling port of the cooling water in a tank becomes higher than the best level of the water-cooled field of an EGR cooler and said tank moreover has the air ****** function Perfect degassing in the water-cooled field in an EGR cooler is realized easily. An accumulator ball stops remaining to the water-cooled field of this EGR cooler 13, and the amount of [accompanied by the poor heat exchange of exhaust gas 8 and cooling water 14] local hot spot does not generate, but a fear of breakage by stress concentration arising also disappears, and it becomes possible to miniaturize an engine.

[0017]

[Embodiment of the Invention] Hereafter, the gestalt of operation of this invention is explained with the example of illustration.

[0018] Drawing 1 - drawing 4 are examples of a gestalt which carry out this invention, and the part which attached the same sign as drawing 5 and drawing 6 expresses the same object among drawing.

[0019] The structure which formed the filling port 19 in the thermostat 16 upper part like drawing 6 mentioned above is abolished, and he builds a tooth space in the upper part of said thermostat 16, and is trying to arrange EGR cooler 13 of a water cooling type to this tooth space in this example of illustration.

[0020] Although said EGR cooler 13 will be arranged in the height location exceeding the cylinder head 18 of an engine 1 On the cylinder-head cover 20 of said engine 1 The tank 23 which has the air ****** function in which it was made to lead the cooling water 14 which the filling port 22 of cooling water 14 was formed in the location higher than the best level x of the water-cooled field of EGR cooler 13, and was poured into this filling port 22 through a crossfire tube 24 to a thermostat 16 is formed. He is trying for the opening level of a filling port 22 to become higher than the best level x of the water-cooled field of EGR cooler 13 by this.

[0021] Here, if drawing 3 explains the internal structure of said EGR cooler 13, in this kind of EGR cooler 13, to the direction both ends of an axial center of the shell 25 formed in the shape of a cylinder, plates 26 and 26 have fixed so that the end face of shell 25 may be blockaded, on these each plates 26 and 26, the both ends of many tubes 27 have fixed in the state of penetration to them, and the tube 27 of these large number is prolonged in the direction of an axial center in the interior of shell 25.

[0022] Near [one] the edge of shell 25, the cooling water installation tubing 28 to which it was made to lead cooling water 14 from an engine 1 side is connected. And near the other-end section of shell 25 The cooling water exhaust pipe 29 (refer to drawing 1 and drawing 2) which discharges the cooling water 14 inside [shell 25] this in a location higher than the best level x of the water-cooled field of EGR cooler 13 in said tank 23 is connected. Cooling water 14 is supplied to the interior of shell 25 from the cooling water installation tubing 28, flows the outside of a tube 27, and is discharged by the exterior of shell 25 from the cooling water exhaust pipe 29.

[0023] namely, -- since the field filled with the cooling water 14 of this shell 25 interior turns into a water-cooled field of EGR cooler 13 mentioned above -- EGR cooler 13 -- abbreviation -- it is level arrangement -- if it becomes, the upper limit location of the building envelope of this shell 25 will call it the best level x of a water-cooled field.

[0024] furthermore, to the anti-shell 25 side of each plates 26 and 26 It fixes so that the bonnets 30 and 30 formed in the shape of a bowl in the building envelope may wrap the end face of each of said plates 26 and 26 entirely. The exhaust gas inlet port 31 is formed in the center of one bonnet 30, and the exhaust gas outlet 32 is formed in the center of the bonnet 30 of another side, respectively. The exhaust gas 8 discharged from an engine 1 goes into the interior of one bonnet 30 from the exhaust gas inlet port 31. After being cooled by heat exchange with the cooling water 14 which flows the outside of this tube 27 while passing along much tube 27 interior, it is discharged inside the bonnet 30 of another side, and recycling is carried out to an engine 1 from the exhaust gas outlet 32.

[0025] In addition, it is made to have not produced the stagnation of cooling water 14 among drawing 3 in the part which stands face to face against the cooling water installation tubing 28 by 33 showing the bypass outlet pipe prepared in the location which confronts in the diameter direction of shell 25 each other to the cooling water installation tubing 28, and extracting some cooling water 14 from this bypass

outlet pipe 33.
[0026] On the other hand, when the height relation of each component of the water-cooled network constituted like the above-mentioned is expressed typically, it comes to be shown in drawing 4 . Said tank 23 The radiator 15 in a water-cooled network, a thermostat 16, a coolant pump 17, an oil cooler 34, turbine 2b of a turbocharger 2, It is installed more highly than a cylinder block 21, the cylinder head 18, and EGR cooler 13, and to the filling port 22 of the cooling water 14 in said tank 23 The cooling water 14 which the reservoir tank 35 for absorbing the cubical expansion accompanying the temperature rise of cooling water 14 was connected, and cooled and carried out the temperature rise of the engine 1 is introduced to the heater core 36, and is used as a heat source of a heater. In addition, in drawing 4 , although the circulation piping 37 of the cooling water 14 cooled with the radiator 15 is illustrated so that it may be located more nearly up than a thermostat 16, it is arranged in fact at the same height as a thermostat 16.
[0027] Next, actuation of the above-mentioned example of illustration is explained.
[0028] Even if it arranges EGR cooler 13 of a water cooling type in the height location exceeding the cylinder head 18 Since the opening level of the filling port 22 of the cooling water 14 in a tank 23 becomes higher than the best level x of the water-cooled field of EGR cooler 13 and said tank 23 moreover has the air ****** function In case cooling water 14 is first poured in from a filling port 22 and all water-cooled networks are filled With the rise of the water level in the water-cooled field in EGR cooler 13, the air of the top in EGR cooler 13 will be extracted from the cooling water exhaust pipe 29 reasonable to a tank 23 side, and perfect degassing in which an accumulator ball does not remain naturally will be realized at the time of the full of water in EGR cooler 13.
[0029] Consequently, perfect degassing in the water-cooled field in EGR cooler 13 is realized easily, an accumulator ball stops remaining to the water-cooled field of this EGR cooler 13, and the amount of [accompanied by the poor heat exchange of exhaust gas 8 and cooling water 14] local hot spot does not generate, but a fear of breakage by stress concentration arising also disappears, and it becomes possible to miniaturize an engine 1.
[0030] In this way, without receiving constraint by the height location of the filling port 22 for pouring in cooling water 14, EGR cooler 13 of a water cooling type may be carried more nearly up than the cylinder head 18, and steam separation of cooling water 14 can be performed good, an engine 1 is miniaturized, and the loading nature to a car may be improved.
[0031] In addition, as for the degassing structure of the water-cooled network for cars of this invention, it is needless to say that modification can be variously added within limits which are not limited only to the above-mentioned example of illustration, and do not deviate from the summary of this invention.
[0032]
[Effect of the Invention] in the above, it explained -- as -- the car of this invention -- service water -- without receiving constraint by the height location of the filling port for pouring in cooling water according to the degassing structure of a cold network, the EGR cooler of a water cooling type may be carried more nearly up than the cylinder head, and steam separation of cooling water can be performed good, and the outstanding effectiveness that an engine is miniaturized and the loading nature to a car may be improved can be done so.

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